PHILIPS

QEL 1/150

V.H.F./U.H.F. TETRODE for use as H.F. amplifier, oscillator, frequency-multiplier and modulator at frequencies up to 500 Mc/s

TETRODE V.H.F./U.H.F. pour utilisation en amplificatrice et oscillatrice H.F., multiplicatrice de fréquence et modulatrice à des fréquences jusqu'à 500 MHz

VHF/UHF-TETRODE zur Verwendung als HF-Verstärker und Oszillator, Frequenzvervielfacher und Modulator bei Frequenzen bis zu 500 MHz

Cathode : oxide-coated
Cathode : oxyde
Katode : Oxyd

Heating : indirect
Chauffage: indirect
Heizung : indirekt

V_f = 6,0 V
I_f = 2,6 A
T_h = min. 30 sec

Capacitances
Capacités
Kapazitäten

C_a = 4,5 pF
C_{g1} = 15,5 pF
C_{ag1} = 0,03 pF

Typical characteristics
Caractéristiques types
Kenndaten

μ_{g2g1} = 5

$S \left\{ \begin{array}{l} V_a = 500 \text{ V} \\ V_{g2} = 250 \text{ V} \\ I_a = 200 \text{ mA} \end{array} \right\} = 12 \text{ mA/V}$

λ	Freq.	C telegr.		C_{ag2} mod.		AB mod		
		V_a	W_o	V_a	W_o	V_a	W_o [3]	W_o [4]
(cm)	(Mc/s)	(V)	(W)	(V)	(W)	(V)	(W)	(W)
182	165	1250	195	1000	140	1250	310	425
		1000	150	800	100	1000	240	315
		750	110	600	80	800	195	240
		600	85	400	55	600	140	170
60	500	1250	140 [1]					
		1000	110 [1]					
		800	90 [1]					
		600	65 [1]					
				Telev. class B				
140	216			1250	250 [2]			
				1000	200 [2]			
				750	135 [2]			

[1] Useful output power in load
Puissance de sortie dans la charge
Nützliche Ausgangsleistung in der Belastung

[2] [3] [4] See page 3; voir page 3; siehe Seite 3

12.12.1958

PHILIPS

QEL1/150

FORCED-AIR COOLED TRANSMITTING TETRODE for use as H.F. amplifier, oscillator, frequency multiplier and modulator at frequencies up to 500 Mc/s

CATHODE: oxide coated

HEATING: indirect by A.C. or D.C.

Heater voltage	V_f	=	6.0 V
Heater current	I_f	=	2.6 A
Waiting time	T_w	=	min. 30 sec

When the tube is driven to max. input as a straight through class C amplifier the heater voltage should be reduced according to the following table

f	$\leq$ 300 Mc/s	300-400 Mc/s	400-500 Mc/s
V_f	6.0 V	5.75 V	5.5 V

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	500 V
Grid No.2 voltage	V_{g_2}	=	250 V
Anode current	I_a	=	200 mA
Mutual conductance	S	=	12 mA/V
Amplification factor of grid No.1 with respect to grid No.2	$\mu_{g_2g_1}$	=	5

Freq (Mc/s)	C telegr.		Cag_2 mod	
	V_a (V)	W_o (W)	V_a (V)	W_o (W)
< 150	2000 1500	370 260	1600 1200	230 160
165	1250 1000 750 600	195 150 110 85	1000 800 600 400	140 100 80 55
500	1250 1000 800 600	170 120 95 50		

AB mod		
V_a (V)	W_o[1] (W)	W_o[2] (W)
2000	580	630
1500	400	440
1000	230	270
800	170	215

Freq. (Mc/s)	B SSB	
	V_a (V)	W_o (PEP) (W)
175	2000 1500 1000	300 220 130

Freq. (Mc/s)	B television	
	V_a (V)	W_o (sync) (W)
216	1250 1000 750	250 200 135

[1]) Without grid current, two tubes

[2]) With grid current, two tubes

Cooling

Forced air through the radiator and in general to the base end of the tube. Air flow and heater voltage must be applied simultaneously.

Seal temperature	max. 150°C
Air-system socket (air-system chimney included)	40222[5])
Air-system chimney (See page 4)	56 590 81/40 ←

The use of this air-system socket with chimney is recommended, since a standard Loctal socket does not ensure an adequate cooling of the base.
All four cathode connections should be used.

[5])Socket type 40222 is intended for circuits where the cathode is at chassis potential.

Refroidissement

Air forcé par le radiateur et en général à la partie inférieure du tube. Le courant d'air et la tension de chauffage seront appliqués simultanément.

Température des scellements	max. 150°C
Support de tube pour le système de ventilation (y incluse la cheminée)	40222[5])
Cheminée pour le système de ventilation (voir page 4)	56 590 81/40 ←

L'usage du support de tube 40222 avec la cheminée 56 590 81/40 est recommandé, un support Loctal normal n'assurant pas un refroidissement adéquat du culot du tube.
Il faut utiliser toutes les quatre connexions de cathode

[5])Le support de tube 40222 est destiné pour des circuits dont la cathode a le potentiel du châssis.

Kühlung

Pressluft durch den Kühler und im allgemeinen auf die Unterseite der Röhre. Luftströmung und Heizspannung müssen gleichzeitig eingeschaltet werden.

Temperatur der Einschmelzungen	max. 150°C
Röhrenfassung für die Ventilationsanlage (Lüftführungsring einbegriffen)	40222[5])
Luftführungsring für die Ventilationsanlage (siehe Seite 4)	56 590 81/40 ←

Da eine richtige Kühlung des Röhrenbodens von einem normalen Loctalfassung nicht gesichert ist, wird die Verwendung der Röhrenfassung 40222 mit dem Führungsring 56 590 81/40 empfohlen. ←
Alle vier Katodenanschlüsse müssen verwendet werden.

[5])Die Fassung 40222 ist bestimmt für Schaltungen in denen die Katode das Chassispotential hat.

CAPACITANCES

Anode to all other elements except grid No.1	C_a	= 4.4 pF
Grid No.1 to all other elements except anode	C_{g_1}	= 16 pF
Anode to grid No.1	C_{ag_1}	= 0.03 pF

COOLING

The use of the air-system socket with chimney is recommended, since a standard loctal socket does not ensure an adequate cooling of the base.
With the air-system socket air is directed over the base seals, past grid No.2 seal, glass envelope and anode seal and through the radiator to provide effective cooling with minimum air flow.
All four cathode connections should be used.

The figures in the table below apply to the simultaneous cooling of the radiator and the base, making use of the socket 40 222 with air chimney 56 590 81/40.

W_a	h	t_i	q min	p_i [1]
250 W	0 m	20 °C	0.16 m^3/min	12 mm H_2O

TEMPERATURE LIMITS (Absolute limits)

Anode temperature	max. 250 °C [2]
Anode seal temperature	max. 200 °C
Base seals and grid No.2 seal temperature	max. 175 °C

MOUNTING POSITION: .arbitrary

NET WEIGHT: 130 g Shipping weight: 300 g

[1]) Pressure drop in caveties etc. excluded
[2]) Measured on base end of anode surface at the junction with the radiator fins

Cooling characteristics
Caractéristiques de refroidissement
Kühlungsdaten

The figures in this table apply to the simultaneous cooling of the radiator and the base, making use of the socket 40222 with chimney 56 590 81/40 ←

Les nombres de cette liste s'appliquent au refroidissement simultané du radiateur et de la côté inférieure du tube, en utilisant le support 40222 avec la cheminée 56 590 81/40 ←

Die Zahlen dieser Tafel gelten bei gleichzeitiger Kühlung des Kühlers und des Röhrenbodens, mit Verwendung der Fassung 40222 mit dem Schornstein 56 590 81/40 ←

W_a (W)	h (m)	ti (°C)	q (m^3/min)	pi (mm H_2O)
150	0	35	0,220	15,0
	0	45	0,258	19,8
	1500	35	0,264	18,3
	3000	25	0,278	17,5

Mounting position: arbitrary
Montage : arbitrairement
Einbau : willkürlich

Net weight / Poids net / Nettogewicht 130 g
Shipping weight / Poids brut / Bruttogewicht 300 g

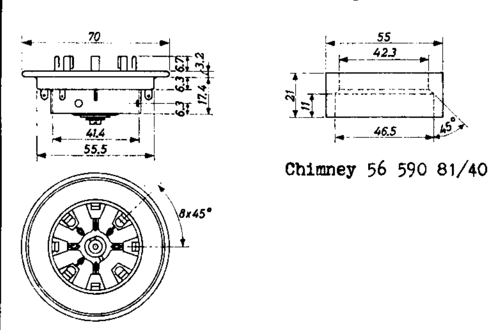
[2])During sync-pulse peak
Pendant la crête de l'impulsion de synchronisation
Während des Scheitels des Synchronisierungsimpulses

[3])Two tubes. Without grid current
Deux tubes. Sans courant de grille
Zwei Röhren. Ohne Gitterstrom

[4])Two tubes. With grid current
Deux tubes. Avec courant de grille
Zwei Röhren. Mit Gitterstrom

Dimensions in mm

At higher frequencies the ring-surface terminal should be used for connecting the screen grid



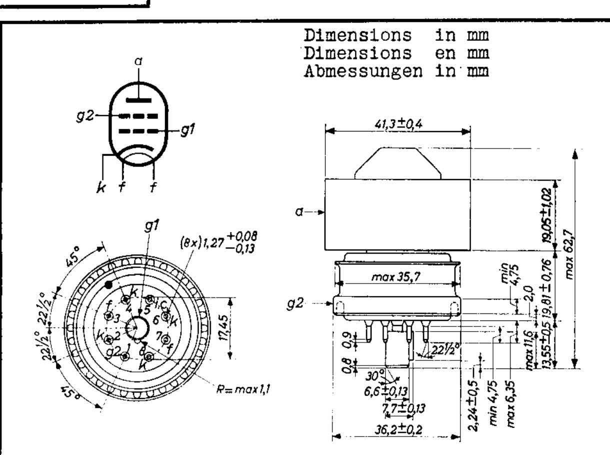
Chimney 56 590 81/40

Socket 40 222

The socket 40 222 is intended for circuits where the cathode is at chassis potential

The type number 40 222 includes the chimney 56 590 81/40

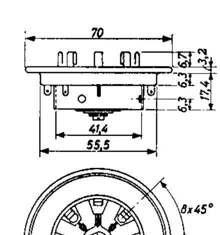
Dimensions in mm
Dimensions en mm
Abmessungen in mm



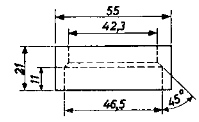
At higher frequencies the ring-surface terminal should be used for connecting the screen grid

A des fréquences élevées la connexion superficielle annulaire sera utilisée pour connecter la grille-écran

Bei höheren Frequenzen muss zum Anschliessen des Schirmgitters der Oberflächenkontaktring benutzt werden



Socket, support, Fassung
40222



Chimney, cheminée, Luftführungsring
56 590 81/40



QEL1/150 PHILIPS

H.F. amplifier and oscillator class C telegraphy or F.M. telephony

LIMITING VALUES (Absolute limits)

			up to 150	150-500	Mc/s
Frequency	f		up to 150	150-500	Mc/s
Anode voltage	V_a	= max.	2000	1250	V
Anode current	I_a	= max.	250	250	mA
Anode input power	W_{ia}	= max.	500	320	W
Anode dissipation	W_a	= max.	250	250	W
Grid No.2 voltage	V_{g_2}	= max.	300	300	V
Grid No.2 dissipation	W_{g_2}	= max.	12	12	W
Grid No.1 voltage	$-V_{g_1}$	= max.	250	250	V
Grid No.1 dissipation	W_{g_1}	= max.	2	2	W
Grid No.1 circuit resistance	R_{g_1}	= max.	25	25	kΩ
Peak heater to cathode voltage	V_{kf_p}	= max.	150	150	V

OPERATING CONDITIONS

Frequency	f		< 150	< 150	Mc/s
Anode voltage	V_a	=	2000	1500	V
Grid No.2 voltage	V_{g_2}	=	250	250	V
Grid No.1 voltage	V_{g_1}	=	-88	-88	V
Peak grid No.1 A.C. voltage	$V_{g_{1p}}$	=	110	110	V
Anode current	I_a	=	250	250	mA
Grid No.2 current	I_{g_2}	=	24	24	mA
Grid No.1 current	I_{g_1}	=	8	8	mA
Grid No.1 input power	W_{ig_1}	=	2.5	1.5	W
Anode input power	W_{ia}	=	500	375	W
Anode dissipation	W_a	=	130	115	W
Output power	W_o	=	370	260	W

H.F. class C telegraphy
H.F. classe C télégraphie
HF-Klasse C Telegraphie

Limiting values
Caractéristiques limites
Grenzdaten

f = max. 500 Mc/s

V_a	= max.	1250 V		V_{g2}	= max.	300 V
W_{ia}	= max.	300 W		W_{g2}	= max.	12 W
W_a	= max.	150 W		$-V_{g1}$	= max.	250 V
I_a	= max.	250 mA		W_{g1}	= max.	2 W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

λ	$\geq$	180	180	180	180	cm
f	$\leq$	165	165	165	165	Mc/s
V_a	=	1250	1000	750	600	V
V_{g2}	=	250	250	250	250	V
V_{g1}	=	-90	-80	-80	-75	V
V_{g1p}	=	105	95	95	90	V
I_a	=	200	200	200	200	mA
I_{g2}	=	20	30	37	37	mA
I_{g1}	=	10	10	10	10	mA
W_{ig1} [1])	=	0,8	0,7	0,7	0,7	W
W_{g2}	=	5	7,5	9,3	9,3	W
W_{ia}	=	250	200	150	120	W
W_a	=	55	50	40	35	W
W_o	=	195	150	110	85	W
η	=	78	75	73,5	71	%

[1]) Driver output, circuit losses not included
Puissance de l'excitateur, ne pas y compris les pertes du circuit
Leistung der Steuerstufe, Kringverluste nicht einbegriffen

1.1.1958

H.F. amplifier and oscillator class C telegraphy or F.M. telephony (continued)

OPERATING CONDITIONS (continued)

						With coaxial cavity				
Frequency	f =	165	165	165	165	500	500	500	500	Mc/s
Anode voltage	V_a =	1250	1000	750	600	1250	1000	800	600	V
Grid No.2 voltage	V_{g2} =	250	250	250	250	280	250	250	250	V
Grid No.1 voltage	V_{g1} =	-90	-80	-80	-75	-90	-110	-110	-110	V
Peak grid No.1 A.C. voltage	V_{g1p} =	106	95	96	91	-	-	-	-	V
Anode current	I_a =	200	200	200	200	250	200	200	170	mA
Grid No.2 current	I_{g2} =	20	31	37	37	6	7	7	6	mA
Grid No.1 current	I_{g1} =	11	10	11	11	12	10	10	6	mA
Grid No.1 input power	W_{ig1} =	1.2	1.0	1.0	1.0	-	-	-	-	W
Driver output power	W_{dr} =	-	-	-	-	30	25	20	15	W
Anode input power	W_{ia} =	250	200	150	120	312	200	160	102	W
Anode dissipation	W_a =	55	50	40	35	142	80	65	52	W
Output power	W_o =	195	150	110	85	170	120	95	50	W

H.F. class C telegraphy (continued)
H.F. classe C télégraphie (continuation)
HF-Klasse C Telegraphie (Fortsetzung)

Operating conditions, single tube, coaxial cavity
Caractéristiques d'utilisation, tube simple, cavité coaxiale
Betriebsdaten, eine Röhre, koaxialer Hohlraum

λ	$\geq$	60	60	60	60	cm
f	$\leq$	500	500	500	500	Mc/s
V_a	=	1250	1000	800	600	V
V_{g2}	=	250	250	250	250	V
V_{g1}	=	-80	-80	-80	-80	V
I_a	=	200	200	200	200	mA
I_{g2}	=	7	7	7	7	mA
I_{g1}	=	10	10	10	10	mA
W_{ig1}	=	10	10	10	10	W
W_{g2}	=	1,8	1,8	1,8	1,8	W
W_{ia}	=	250	200	160	120	W
W_o	=	140	110	90	65	W
η	=	56	55	56	54	%

H.F. class C anode and screen-grid modulation
H.F. classe C modulation de l'anode et de la grille écran
HF-Klasse C Anoden- und Schirmgittermodulation

Screen-grid modulation 55% at 100% anode modulation. Self-modulation of the screen-grid by means of a series resistor or choke should not be applied

Modulation de la grille écran 55% à 100% modulation de l'anode. Auto-modulation de la grille écran au moyen d'une résistance ou d'une bobine n'est pas recommandée

Schirmgittermodulation 55% bei einer Anodenmodulation von 100%. Selbstmodulation des Schirmgitters mittels eines Reihenwiderstandes oder einer Reihendrossel wird nicht empfohlen

H.F. amplifier class C telephony, anode and screen grid modulator

LIMITING VALUES (Absolute limits)

Frequency	f	up to 150	150-500 Mc/s
Anode voltage	V_a	= max. 1600	1000 V
Anode current	I_a	= max. 200	200 mA
Anode input power	W_{ia}	= max. 480	300 W
Anode dissipation	W_a	= max. 165	165 W
Grid No.2 voltage	V_{g_2}	= max. 300	300 V
Grid No.2 dissipation	W_{g_2}	= max. 10	10 W
Grid No.1 voltage	$-V_{g_1}$	= max. 250	250 V
Grid No.1 dissipation	W_{g_1}	= max. 2	2 W
Grid No.1 circuit resistance	R_{g_1}	= max. 25	25 kΩ
Peak heater to cathode voltage	$V_{kf\,p}$	= max. 150	150 V

OPERATING CONDITIONS

Frequency	f	< 150	< 150 Mc/s
Anode voltage	V_a =	1600	1200 V
Grid No.2 voltage	V_{g_2} =	250	250 V
Grid No.1 voltage	V_{g_1} =	-118	-118 V [1]
Peak grid No.1 A.C. voltage	$V_{g_1\,p}$ =	136	136 V
Anode current	I_a =	200	200 mA
Grid No.2 current	I_{g_2} =	23	23 mA
Grid No.1 current	I_{g_1} =	5	5 mA
Grid No.1 input power	W_{ig_1} =	3	2 W
Anode input power	W_{ia} =	320	240 W
Anode dissipation	W_a =	90	80 W
Output power	W_o =	230	160 W
Modulation depth	m =	100	100 %
Peak grid No.2 modulation voltage	$V_{g_2\,p}$ =	200	180 V
Modulation power	W_{mod} =	115	80 W

[1]) Obtained from grid No.1 resistor or from a combination of grid No.1 resistor with either fixed supply or cathode resistor

H.F. class C anode and screen-grid modulation (continued)
H.F. classe C modulation de l'anode et de grille écran (continuation)
HF-Klasse C Anoden- und Schirmgittermodulation (Fortsetzung)

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	1000 V		V_{g2}	= max.	300 V
W_{ia}	= max.	200 W		W_{g2}	= max.	12 W
W_a	= max.	100 W		$-V_{g1}$	= max.	250 V
I_a	= max.	200 mA		W_{g1}	= max.	2 W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

λ	≧	180	180	180	180	cm
f	≦	165	165	165	165	Mc/s
V_a	=	1000	800	600	400	V
V_{g2}	=	250	250	250	250	V
V_{g1}	=	-105	-100	-95	-90	V
V_{g1p}	=	125	120	120	110	V
I_a	=	200	200	200	200	mA
I_{g2}	=	20	25	35	40	mA
I_{g1}	=	15	10	8	7	mA
W_{ig1}	=	2	1,5	1	1	W
W_{g2}	=	5	6,3	8,8	10	W
W_{ia}	=	200	160	120	80	W
W_a	=	60	60	40	25	W
W_o	=	140	100	80	55	W
η	=	70	63	66	69	%
m	=	100	100	100	100	%
V_{g2p}	=	170	160	150	140	V
W_{mod}	=	100	80	60	40	W

H.F. amplifier class C telephony, anode and screen grid modulator (continued)

OPERATING CONDITIONS (continued)

Parameter	Symbol					Unit
Frequency	f	=	165	165	165	165 Mc/s
Anode voltage	V_a	=	1000	800	600	400 V
Grid No.2 voltage	V_{g2}	=	250	250	250	250 V
Grid No.1 voltage	V_{g1}	=	-105	-100	-95	-90 V [1]
Peak grid No.1 A.C. voltage	$V_{g1\,p}$	=	125	120	120	110 V
Anode current	I_a	=	200	200	200	200 mA
Grid No.2 current	I_{g2}	=	20	25	30	35 mA
Grid No.1 current	I_{g1}	=	15	10	8	7 mA
Grid No.1 input power	W_{ig1}	=	2	1.5	1.0	1.0 W
Anode input power	W_{ia}	=	200	160	120	80 W
Anode dissipation	W_a	=	60	60	40	25 W
Output power	W_o	=	140	100	80	55 W
Modulation depth	m	=	100	100	100	100 %
Peak grid No.2 modulation voltage	$V_{g2\,p}$	=	170	160	150	140 V
Modulation power	W_{mod}	=	70	50	40	27.5 W

[1]) Obtained from grid No.1 resistor or from a combination of grid No.1 resistor with either fixed supply or cathode resistor

PHILIPS

H.F. class B amplifier for television service, negative modulation, positive synchronisation
Amplificatrice H.F. classe B pour télévision, modulation négative, synchronisation positive
HF-Klasse B Verstärker für Fernsehsender, negative Modulation, positive Synchronisierung

Limiting values
Caractéristiques limites
Grenzdaten

f	= max.	220 Mc/s	I_a	= max.	250 mA
V_a	= max.	1250 V	W_a	= max.	150 W
V_{g2}	= max.	400 V	W_{g2}	= max.	12 W
$-V_{g1}$	= max.	250 V	W_{g1}	= max.	2 W

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f		=	216	216	216	Mc/s
B		=	5	5	5	Mc/s
V_a		=	1250	1000	750	V
V_{g2}		=	300	300	300	V
V_{g1}		=	-70	-65	-60	V
V_{g1p}	sync	=	100	95	85	V
	black, noir, schwarz	=	75	70	65	V
I_a	sync	=	305	330	335	mA
	black, noir, schwarz	=	230	240	245	mA
I_{g2}	sync	=	45	45	50	mA
	black, noir, schwarz	=	10	15	20	mA
I_{g1}	sync	=	25	20	15	mA
	black, noir, schwarz	=	4	4	4	mA
W_{ig1}	sync	=	9	8	7	W
	black, noir, schwarz	=	5,5	4,7	4,25	W
W_{ia}	black, noir, schwarz	=	290	240	185	W
W_o	sync	=	250	200	135	W
	black, noir, schwarz	=	140	110	75	W

→ H.F. class B amplifier, single side band

LIMITING VALUES (Absolute limits)

			up to 175	500 Mc/s
Frequency	f			
Anode voltage	V_a	= max.	2000	1250 V
Anode current	I_a	= max.	250	250 mA
Anode input power	W_{ia}	= max.	500	315 W
Anode dissipation	W_a	= max.	250	250 W
Grid No.2 voltage	V_{g2}	= max.	400	400 V
Grid No.2 dissipation	W_{g2}	= max.	12	12 W
Grid No.1 voltage	$-V_{g1}$	= max.	250	250 V
Grid No.1 circuit resistance (with fixed bias)	R_{g1}	= max.	25	25 kΩ
Peak cathode to heater voltage	$V_{kf\,p}$	= max.	150	150 V

OPERATING CONDITIONS

Operation with cathode bias is not recommended

Frequency	f	=	175	Mc/s
Anode voltage	V_a	=	2000	V
Grid No.2 voltage	V_{g2}	=	300	V
Grid No.1 voltage	V_{g1}	=	-47	V
Load resistance	$R_{a\sim}$	=	4200	Ω

			zero signal	single tone signal	double tone signal
Peak grid No.1 A.C. voltage	$V_{g1\,p}$	=	0	47	47 V
Anode current	I_a	=	75	250	160 mA
Grid No.2 current	I_{g2}	=	-1	-7	-5 mA
Grid No.1 current	I_{g1}	=	0	0	0 mA
Grid No.1 input power	W_{ig1}	=	0	0	0 W
Anode input power	W_{ia}	=	150	500	320 W
Anode dissipation	W_a	=	150	200	170 W
Output power	W_o	=	0	300	150 W
Peak envelope power	W_o(PEP)	=	-	-	300 W
Third harmonic distortion	d_3	=	-	-	-32 dB

PHILIPS

QEL 1/150

L.F.class AB amplifier and modulator
Amplificatrice et modulatrice B.F. classe AB
NF-Verstärker und Modulator Klasse AB

Limiting values
Caractéristiques limites
Grenzdaten

V_a	= max.	1250	V	W_{g2}	= max.	12	W
W_{ia}	= max.	300	W	W_{g1}	= max.	2	W
W_a	= max.	150	W	R_{g1}	= max.	100	kΩ [1]
I_a	= max.	250	mA				
V_{g2}	= max.	400	V				

Operating conditions, two tubes without grid current
Caractéristiques d'utilisation, deux tubes sans courant de grille
Betriebsdaten, zwei Röhren ohne Gitterstrom

V_a	=	1250		1000		V
V_{g2}	=	300		300		V
V_{g1}	=	-48		-47		V
R_{aa}	=	7200		5850		Ω
V_{g1g1p}	=	0	96	0	94	V
I_a	=	2x57,5	2x195	2x60	2x190	mA
I_{g2}	=	0	2x20	0	2x30	mA
W_{g2}	=	0	2x6	0	2x9	W
W_{ia}	=	2x72	2x244	2x60	2x190	W
W_a	=	2x72	2x89	2x60	2x70	W
W_o	=	0	310	0	240	W
η	=	-	63,5	-	63	%

[1]) Each tube
Chaque tube
Jede Röhre

H.F. class B amplifier, single side band (continued)

OPERATING CONDITIONS (continued)

Operation with cathode bias is not recommended

Frequency	f	=		175			175		Mc/s
Anode voltage	V_a	=		1500			1000		V
Grid No.2 voltage	V_{g2}	=		300			315		V
Grid No.1 voltage	V_{g1}	=		-45			-44.5		V
Load resistance	$R_{a\sim}$	=		2900			1850		Ω
			zero signal	single tone signal	double tone signal	zero signal	single tone signal	double tone signal	
Peak grid No.1 A.C. voltage	V_{g1p}	=	0	45	45	0	44.5	44.5	V
Anode current	I_a	=	75	250	165	100	250	180	mA
Grid No.2 current	I_{g2}	=	-2	-4	-5	-4	20	0	mA
Grid No.1 current	I_{g1}	=	0	0	0	0	0	0	mA
Grid No.1 input power	W_{ig1}	=	0	0	0	0	0	0	W
Anode input power	W_{ia}	=	115	375	250	100	250	180	W
Anode dissipation	W_a	=	115	155	140	100	120	115	W
Output power	W_o	=	0	220	110	0	130	65	W
Peak envelope power	W_o(PEP)	=	-	-	220	-	-	130	W
Third harmonic distortion	d_3	=	-	-	-31	-	-	-30	dB

L.F.class AB amplifier and modulator (continued)
Amplificatrice et modulatrice B.F. classe AB(continuation)
NF-Verstärker und Modulator Klasse AB(Fortsetzung)

Operating conditions, two tubes without grid current
Caractéristiques d'utilisation, deux tubes sans courant de grille
Betriebsdaten, zwei Röhren ohne Gitterstrom

V_a	=	800		600		V
V_{g2}	=	300		300		V
V_{g1}	=	-47		-44		V
R_{aa}	=	4625		3550		Ω
V_{g1g1p}	=	0	94	0	88	V
I_a	=	2x60	2x190	2x80	2x190	mA
I_{g2}	=	0	2x32,5	0	2x32,5	mA
W_{g2}	=	0	2x9,8	0	2x9,8	W
W_{ia}	=	2x48	2x152	2x48	2x114	W
W_a	=	2x48	2x55	2x48	2x44	W
W_o	=	0	195	0	140	W
η	=	-	64	-	61	%

Operating conditions, two tubes with grid current
Caractéristiques d'utilisation deux tubes à courant de grille
Betriebsdaten, zwei Röhren mit Gitterstrom

V_a	=	1250		1000		V
V_{g2}	=	300		300		V
V_{g1}	=	-44		-43		V
R_{aa}	=	5600		4600		Ω
V_{g1g1p}	=	0	100	0	98	V
I_a	=	2x90	2x238	2x82,5	2x247	mA
I_{g2}	=	0	2x32,5	0	2x35	mA
I_{g1p}	=	0	10	0	10	mA
W_{ig1}	=	0	2x0,037	0	2x0,037	W
W_{g2}	=	0	2x10	0	2x10	W
W_{ia}	=	2x112	2x297	2x82,5	2x247	W
W_a	=	2x112	2x85	2x82,5	2x90	W
W_o	=	0	425	0	315	W
η	=	-	72	-	64	%

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→ A.F. power amplifier and modulator, class AB without grid current

LIMITING VALUES (Absolute limits)

Anode voltage	V_a	= max.	2000	V
Anode current	I_a	= max.	250	mA
Anode dissipation	W_a	= max.	250	W
Anode input power	W_{ia}	= max.	500	W
Grid No.2 voltage	V_{g2}	= max.	400	V
Grid No.2 dissipation	W_{g2}	= max.	12	W
Grid No.1 circuit resistance (each tube)	R_{g1}	= max.	100	kΩ
Peak cathode to heater voltage	$V_{kf\ p}$	= max.	150	V

OPERATING CONDITIONS (two tubes)

Anode voltage	V_a	=	2000		V
Grid No.2 voltage	V_{g2}	=	300		V
Grid No.1 voltage	V_{g1}	=	-50		V
Load resistance	$R_{a\sim}$	=	8760		Ω
Peak grid to grid A.C. voltage	V_{g1g1p}	=	0	100	V
Anode current	I_a	=	2x50	2x235	mA
Grid No.2 current	I_{g2}	=	-	2x18	mA
Grid No.2 dissipation	W_{g2}	=	-	2x5.4	W
Anode input power	W_{ia}	=	2x100	2x470	W
Anode dissipation	W_a	=	2x100	2x180	W
Output power	W_o	=	0	580	W

L.F.class AB amplifier and modulator (continued)
Amplificatrice et modulatrice B.F. classe AB(cont.)
NF-Verstärker und Modulator Klasse AB (Fortsetzung)

Operating conditions, two tubes with grid current
Caractéristiques d'utilisation, deux tubes à courant de grille
Betriebsdaten, zwei Röhren mit Gitterstrom

V_a	=	800		600		V
V_{g2}	=	300		300		V
V_{g1}	=	-43		-41		V
R_{aa}	=	3500		2600		Ω
V_{g1g1_p}	=	0	96	0	94	V
I_a	=	2x80	2x245	2x92,5	2x243	mA
I_{g2}	=	0	2x37,5	0	2x42,5	mA
I_{g1_p}	=	0	10	0	10	mA
W_{ig1}	=	0	2x0,037	0	2x0,037	W
W_{g2}	=	0	2x11	0	2x12,7	W
W_{ia}	=	2x64	2x196	2x55,5	2x146	W
W_a	=	2x64	2x76	2x55,5	2x61	W
W_o	=	0	240	0	170	W
η	=	-	61	-	58	%

A.F. power amplifier and modulator, class AB without grid current (continued)

OPERATING CONDITIONS (two tubes; continued)

Anode voltage	V_a	=	1500		1000		800	V
Grid No.2 voltage	V_{g_2}	=	300		300		300	V
Grid No.1 voltage	V_{g_1}	=	-50		-43		-40	V
Load resistance	$R_{a\sim}$	=	6570		4250		4400	Ω
Peak grid to grid A.C. voltage	$V_{g_1g_1p}$	=	0	100	0	86	0	80 V
Anode current	I_a	=	2x50	2x228	2x82.5	2x225	2x105	2x218 mA
Grid No.2 current	I_{g_2}	=	-	2x21	-	2x26	-	2x38 mA
Grid No.2 dissipation	W_{g_2}	=	-	2x6.3	-	2x7.8	-	2x11.4 W
Anode input power	W_{ia}	=	2x75	2x340	2x82.5	2x225	2x84	2x174 W
Anode dissipation	W_a	=	2x75	2x140	2x82.5	2x110	2x84	2x89 W
Output power	W_o	=	0	400	0	230	0	170 W

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→ A.F. power amplifier and modulator, class AB with grid current

LIMITING VALUES (Absolute limits)

Anode voltage	V_a	= max.	2000 V
Anode current	I_a	= max.	250 mA
Anode dissipation	W_a	= max.	250 W
Anode input power	W_{ia}	= max.	500 W
Grid No.2 voltage	V_{g2}	= max.	400 V
Grid No.2 dissipation	W_{g2}	= max.	12 W
Grid No.1 dissipation	W_{g1}	= max.	2 W
Grid No.1 circuit resistance (each tube)	R_{g1}	= max.	100 kΩ
Peak cathode to heater voltage	V_{kf_p}	= max.	150 V

OPERATING CONDITIONS (two tubes)

Anode voltage	V_a	=	2000		V
Grid No.2 voltage	V_{g2}	=	300		V
Grid No.1 voltage	V_{g1}	=	-50		V
Load resistance	$R_{a\sim}$	=	8100		Ω
Peak grid to grid A.C. voltage	$V_{g1g1\,p}$	=	0	106	V
Driving power	W_{dr}	=	0	0.2	W
Anode current	I_a	=	2x50	2x250	mA
Grid No.2 current	I_{g2}	=	-	2x18	mA
Grid No.2 dissipation	W_{g2}	=	-	2x5.4	W
Anode input power	W_{ia}	=	2x100	2x500	W
Anode dissipation	W_a	=	2x100	2x185	W
Output power	W_o	=	-	630	W

A.F. amplifier and modulator, class AB with grid current (continued)

OPERATING CONDITIONS (two tubes; continued)

Parameter	Symbol									Unit
Anode voltage	V_a	=	1500		1000		800			V
Grid No.2 voltage	V_{g2}	=	300		300		300			V
Grid No.1 voltage	V_{g1}	=	-50		-45		-40			V
Load resistance	$R_{a\sim}$	=	5970		3950		3140			Ω
Peak grid to grid A.C. voltage	$V_{g1g1\,p}$	=	0	106	0	98	0	90		V
Driving power	W_{dr}	=	0	0.2	0	0.15	0	0.15		W
Anode current	I_a	=	2x50	2x250	2x83	2x247	2x105	2x250		mA
Grid No.2 current	I_{g2}	=	-	2x18	-	2x29	-	2x40		mA
Grid No.2 dissipation	W_{g2}	=	-	2x5.4	-	2x8.7	-	2x12		W
Anode input power	W_{ia}	=	2x75	2x375	2x83	2x247	2x84	2x200		W
Anode dissipation	W_a	=	2x75	2x155	2x83	2x112	2x84	2x93		W
Output power	W_o	=	0	440	0	270	0	215		W

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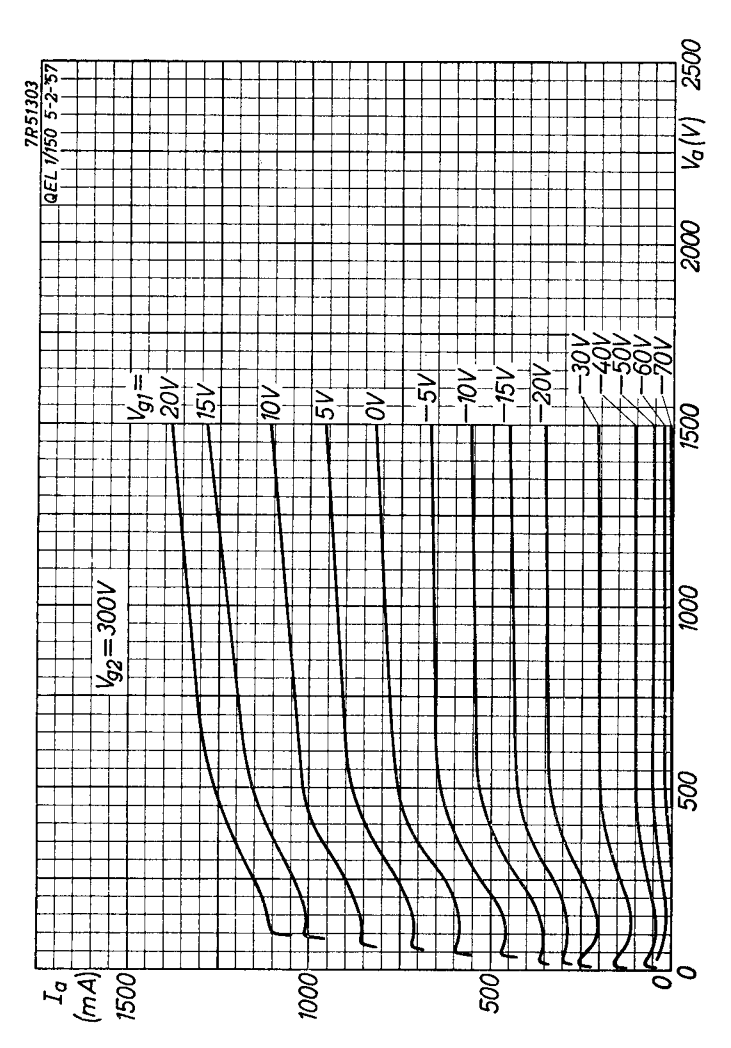
H.F. amplifier, class B television service
Negative modulation, positive synchronisation

→ LIMITING VALUES (Absolute limits)

Frequency	f	=	54 to 216 Mc/s
Anode voltage	V_a	= max.	1250 V
Anode current	I_a	= max.	250 mA
Anode dissipation	W_a	= max.	250 W
Anode input power	W_{ia}	= max.	500 W
Grid No.2 voltage	V_{g2}	= max.	400 V
Grid No.2 dissipation	W_{g2}	= max.	12 W
Grid No.1 voltage	$-V_{g1}$	= max.	250 V
Grid No.1 dissipation	W_{g1}	= max.	2 W
Grid No.1 circuit resistance	R_{g1}	= max.	50 kΩ
Peak cathode to heater voltage	$V_{kf\,p}$	= max.	150 V

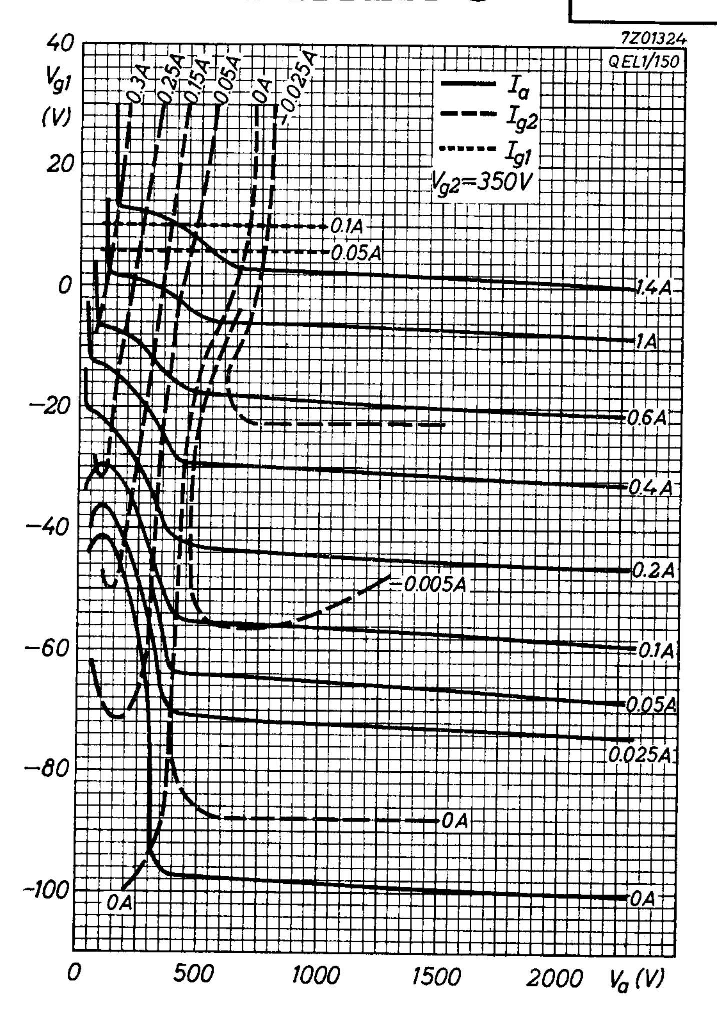
OPERATING CONDITIONS at centre frequency of resonance curve

Frequency	f		= 216	216	216	Mc/s
Bandwidth at -1.5 dB	B		= 5	5	5	Mc/s
Anode voltage	V_a		= 1250	1000	750	V
Grid No.2 voltage	V_{g2}		= 300	300	300	V
Grid No.1 voltage	V_{g1}		= -70	-65	-60	V
Peak grid No.1 A.C. voltage	V_{g1p}	sync	= 100	95	85	V
		black	= 75	70	65	V
Anode current	I_a	sync	= 305	330	335	mA
		black	= 230	240	245	mA
Grid No.2 current	I_{g2}	sync	= 45	45	50	mA
		black	= 10	15	20	mA
Grid No.1 current	I_{g1}	sync	= 25	20	15	mA
		black	= 4	4	4	mA
Grid No.1 input power	W_{ig1}	sync	= 9	8	7	W
		black	= 5.5	4.7	4.25	W
Output power	W_o	sync	= 250	200	135	W
		black	= 140	110	75	W

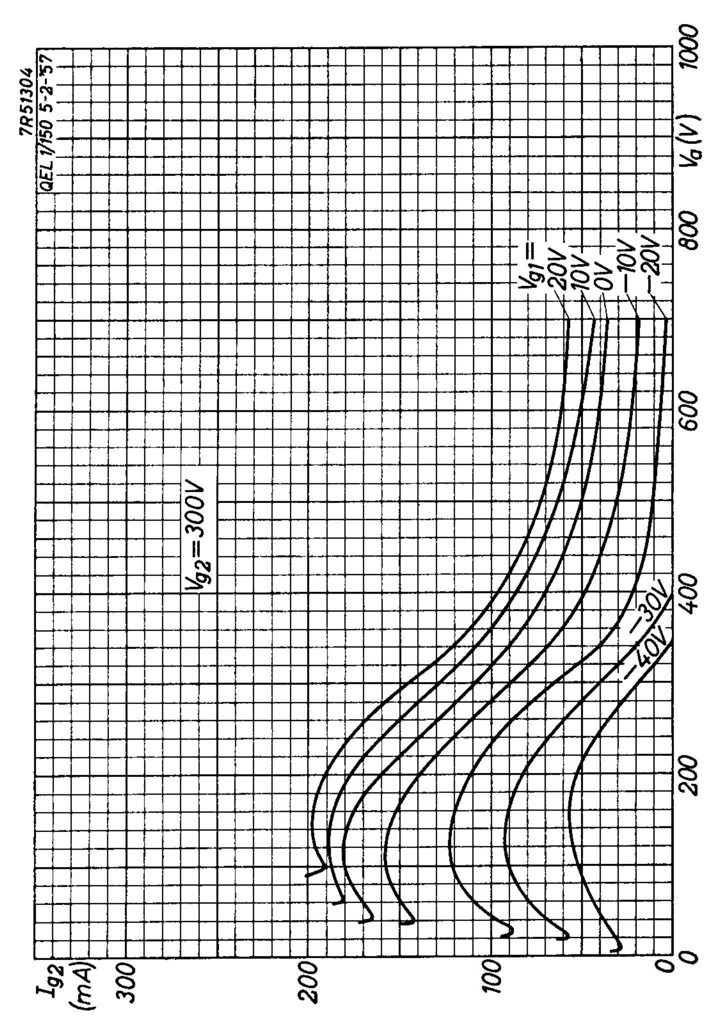

7R51303
QEL 1/150 5-2-'57
V_{g2}=300V
V_{g1}=
20V
15V
10V
5V
0V
−5V
−10V
−15V
−20V
−30V
−40V
−50V
−60V
−70V
V_a(V)
0
500
1000
1500
2000
2500
I_a
(mA)
1500
1000
500
0

PHILIPS

QEL1/150

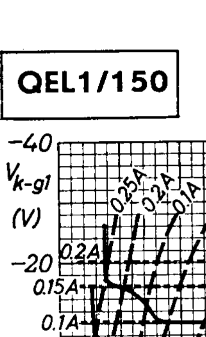


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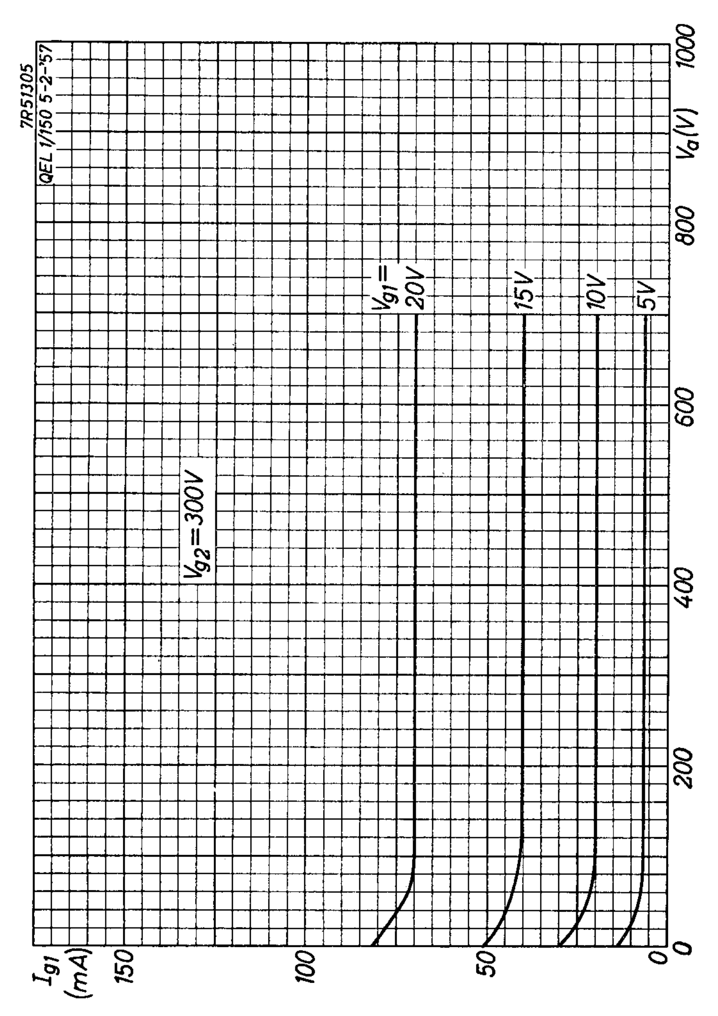

7R51304
QEL 1/150 5-2-'57
V_{g2} = 300V
V_{g1} =
20V
10V
0V
−10V
−20V
−30V
−40V
I_{g2} (mA)
300
200
100
0
V_a (V)
0
200
400
600
800
1000

QEL1/150

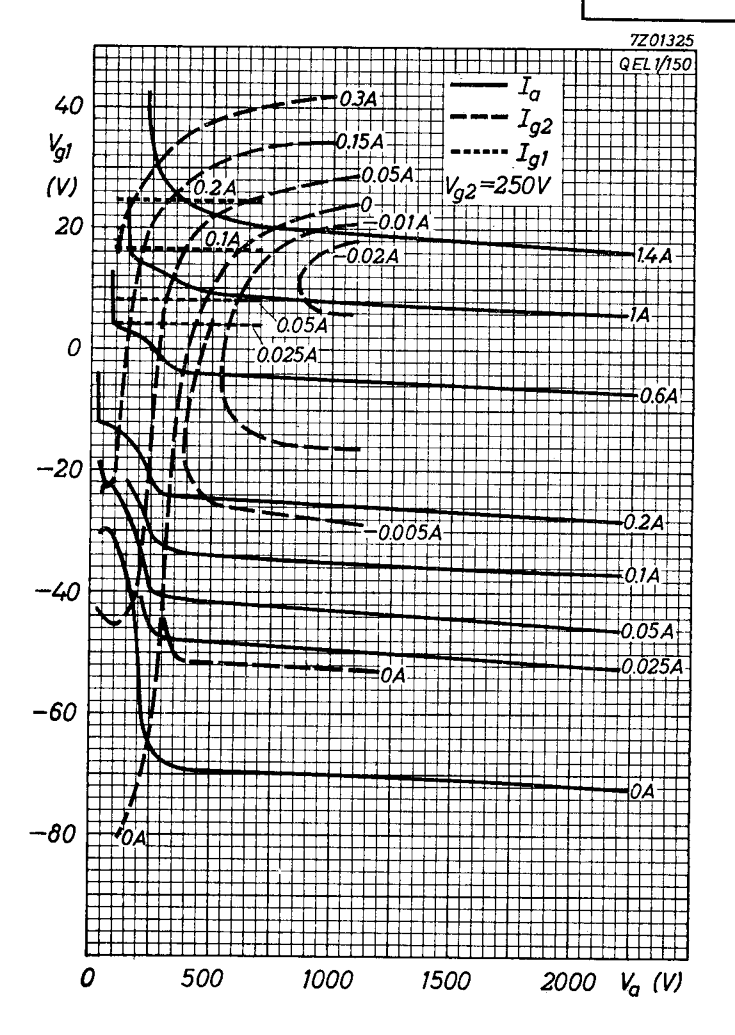
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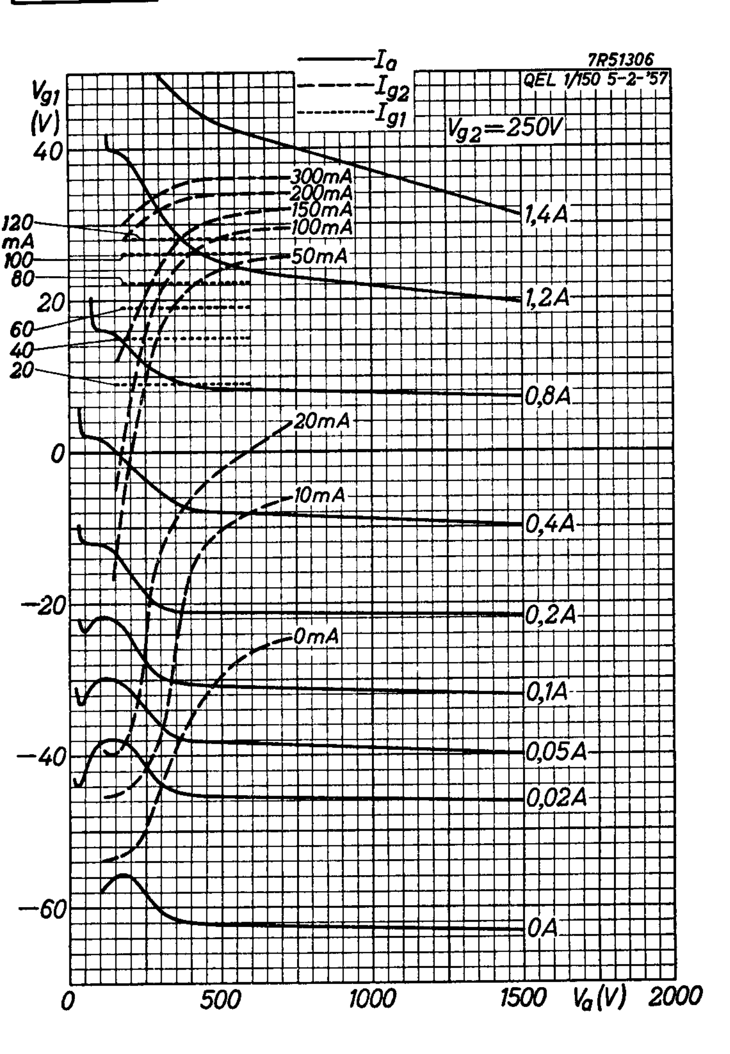
B



7R51305
QEL 1/150 5-2-'57
V_{g1}=
20V
15V
10V
5V
V_{g2}=300V
V_a(V)
1000
800
600
400
200
0
I_{g1}
(mA)
150
100
50
0


7Z01325
QEL1/150
I_a
I_{g2}
I_{g1}
V_{g2}=250V
V_{g1} (V)
40
20
0
−20
−40
−60
−80
0
500
1000
1500
2000
V_a (V)
0.3A
0.15A
0.05A
0
−0.01A
−0.02A
0.2A
0.1A
0.05A
0.025A
1.4A
1A
0.6A
0.2A
0.1A
0.05A
0.025A
0A
−0.005A
0A
0A

PHILIPS



7R51306
QEL 1/150 5-2-'57
I_a
I_{g2}
I_{g1}
V_{g2}=250V
V_{g1} (V)
40
20
0
−20
−40
−60
120 mA
100
80
60
40
20
300mA
200mA
150mA
100mA
50mA
20mA
10mA
0mA
1,4A
1,2A
0,8A
0,4A
0,2A
0,1A
0,05A
0,02A
0A
0
500
1000
1500
V_a(V)
2000



f_{imp}=0 to 1000 c/s
For f_{imp} > 1000 c/s
T_{imp} should be decreased proportionally

$I_{a_{max}}$

I_{a_p}=max 6A

7Z01329
QEL1/150

$I_{a_{imp}}$ (A): 0, 2, 4, 6, 8

T_{imp} (μsec): 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, 10000



QEL1-150

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30	C	1957.02.02
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34, 35	FP	2000.01.15